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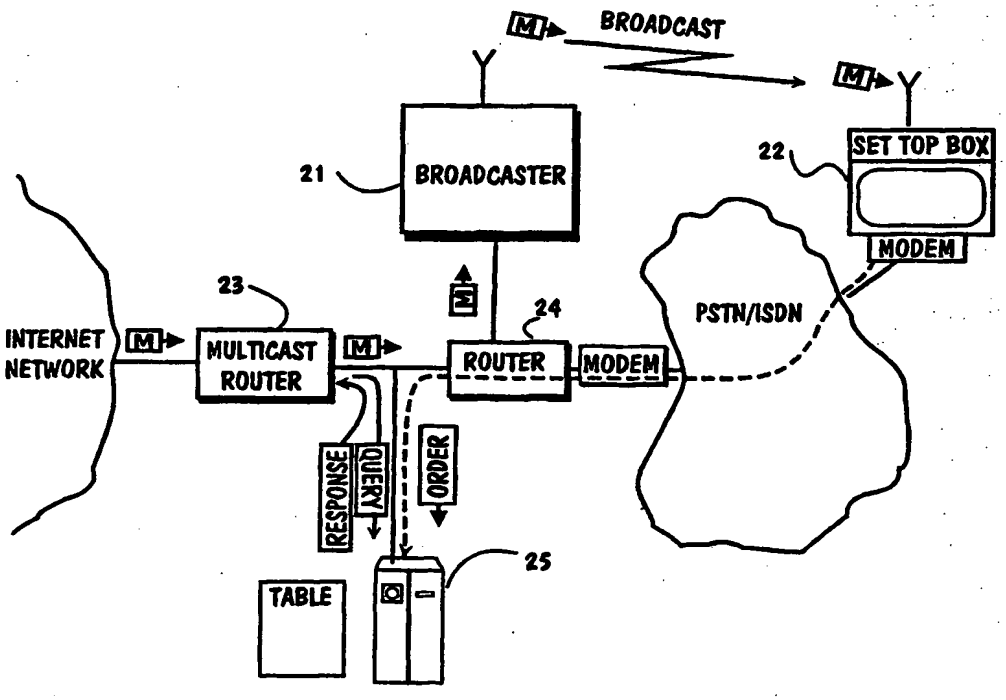
(54) Title: IP MULTICAST SERVICE WITHOUT A RETURN CONNECTION

(57) Abstract

The problem with transferring a multicast service to a television environment, or other environment without a return connection, is how the service provider receives the information about receivers willing to receive the service and how the multicast router can query the receiver sets as to whether they want to receive. The problem is solved by choosing one of the servers within the scope of influence of the querying multicast router to be an order server. The receiver sets, without return connections, notify the server of the services they want to receive, and likewise notify when they no longer want to receive the service. The notifications to the server can be made via a modem connection through a fixed network, for instance using a Web form. The next time the server makes the query about receivers willing to receive the service, the order server will reply on behalf of the receiver set. In this case, the multicast router routes the desired services to the transmission system of the television operator's broadcasting network, which then adds the packets to the multiplexed transmission of the general broadcast. The receiving set will in turn receive the broadcast, recognise the service by its identifying data and separate the service packets from the multiplexed transmission.



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IP multicast service without a return connection

Field of the invention

The invention relates to transmitting an IP multicast service, via the Internet, to a receiver without a return connection.

Background

Even today, it is possible to implement a so-called Internet-via-TV device; examples of this are WebTV or NetStation. The device is connected to an ordinary analogue TV set and it allows surfing on the Internet Web pages and sending e-mail. The device simply utilises the TV set's cathode ray tube CRT to display the Web pages received via a modem connection.

Digital Terrestrial Television Broadcasting (DTTB) offers many advantages compared with the conventional analogue broadcasting method. The picture and sound quality are considerably better, and the same multiplexed transmission allows the broadcasting of pictures to both HDTV (High Definition Television) and SDTV (Standard Definition Television) standards. In addition, the multiplexed transmission makes it possible to transmit multimedia services such as audio, video, data and text.

At present, two digital standards have been established: the American ATSC (Advanced Television System Committee) and the European DVB (Digital Video Broadcasting). The European DVB standard is intended as the basis for satellite transmission, cable transmission, terrestrial transmission and multi-point broadcasting. Video coding and compression are based on the MPEG-2 algorithm, and OFDM (Orthogonal Frequency Division Multiplexing) is used in the terrestrial transmission system.

At its simplest, the digital television is only suitable for receiving a broadcast over the air. As an additional feature, it may also include reception of text transmissions. For receiving pay-TV broadcasts, a card reader and other technical accessories are required. A modem can also be integrated, allowing the set to communicate with an external system either via a fixed network or a radio network. Because, unlike in analogue systems, there is no relation between the service and the channel (frequency) in a digital system, a navigating program is placed in the set, allowing the viewer to receive the desired service. Such a program is called an EPG (Electronic

Programme Guide). The more numerous the functions of the TV set, the more memory, processing capacity and utility software it requires.

A digital system makes new types of TV services and new ways of using the TV set possible. The use of a modem makes possible the interactive TV, where the set is capable of running small software applications transmitted as part of the TV broadcasting signal. The viewer can, using the remote control, click on an application that is embedded in the received broadcast and shown on the screen. The application may be, e.g. a small program, embedded in an advertisement, which responds to clicking by performing a certain function shown on the screen. As a response to clicking, the modem may also connect to a remote server, for instance allowing the viewer to order a product right away or to send messages via the modem to the service provider. The TV broadcast being a one-way transmission, the modem connection acts as the missing "return connection".

The thinking in the industry has been that, commercially speaking, the biggest advantage of the digital TV is its ability to offer the viewer a chance to react immediately to a commercial or paid service, by offering a direct link through a modem to the advertiser's home page or a chance to request, via the modem connection, the service provider to add more information to the general broadcast.

In a digital TV system, it would be advantageous for the service provider to include a data channel in the multiplexed transmission for transmitting data to a specified group of receivers in such a way that the receiver could easily choose which channels he wishes to receive from the multitude of channels on offer. By data channel, we mean other than the audio and video channels of ordinary free or paid television programs. The data channel would be used to transmit, for example, picture files, sound files, text files, software, Web pages, etc.

It would be very advantageous to be able to transmit multicast services produced for the Internet to the TV sets through a multiplexed digital TV transmission. The relevant point about the multicast standard, intended for fixed IP networks, is that the network routers poll the receivers around them at regular intervals, as to which of them wish to receive multicast packets. The receivers notify the router of their willingness to receive the subject multicast broadcast. The standardised multicast transmission would, there-

fore, in principle be most suitable for wireless mass distribution through a digital television system, but it is not suitable for an environment of the type described above, because it has no return channel. Even if it is a well-known technique to include a modem in digital television sets and to use a fixed network modem connection as the return channel, the return channel is a one-way channel in the sense that it is activated by the TV set.

The problem in transmitting the desired multicast service to the TV environment, or other environment lacking a return connection, is how will the service provider get information about receivers willing to receive the service and how can the multicast router poll the sets as to whether they still want to receive the service they had previously ordered.

Summary of the invention

The objective of this invention is thus to find the mechanisms for implementing a service using the multicast protocol, well known from the Internet environment context and requiring a return connection, in an environment without a return connection such as a digital television system. The problem is solved, using the methods described in the independent patent claims, in such a way that one of the servers within the scope of influence of the multicast router is nominated as the order server. The order server can be an existing server, which operates as an order server while continuing with its other tasks, or a completely new server installed to operate exclusively as an order server. The receiver sets without return connections wishing to receive multicast services notify this server of the services they want to receive, and also give notice when they no longer wish to receive it. Notifying the server can be done via a modem connection through the fixed network, using e.g. a Web form. Equally, the receiver set can send the information through radio waves to another receiver which forwards it to the order server. Information about the receivers' willingness or unwillingness to receive multicast broadcasts is stored in a table in the order server's memory.

From the point of the polling multicast router, the receiver sets have thus been reduced to order servers, or, more specifically, to a table of data in the order server's memory. When a receiver set wants an authorisation to receive the service of its chosen multicast group, it notifies the order server of this. The next time the router makes a query about receivers willing to

receive the service, this request by the receiver set is already recorded with the order server which then replies on behalf of the receiver set. In this case, the multicast router will effect the routing of the service in question so that it is available to the receiver set. Routing continues until the last receiver set has notified the order server of its wish to stop receiving the service. Then, the router no longer receives a reply to its query from the order server, and stops routing the service in question to the receiver sets. The order server can also separately notify the router of the termination of the routing.

When the receiver set is a digital television set, the router will effect the routing of the multicast packets to the broadcasting system of the television operator's broadcasting network, which will then add the packets to the multiplexed transmission of the general broadcast. The receiver set will in turn receive the transmission, recognise the service by its identifier and separate the service packets from the multiplexed transmission.

List of figures

The invention will be described below with the aid of the appended schematic drawings, wherein

Figure 1 shows a multicast system,
Figure 2 shows an arrangement according to the invention in an environment without a return connection,
Figure 3 shows a digital television system with a multicast service, and
Figure 4 shows the handling of addresses at transmitting and receiving ends.

Detailed description of the invention

IP traffic is nearly always point-to-point traffic between the transmitter and the receiver. If the server transmits the same piece of information to several addresses, it must send it as many times as there are recipients. Thus, the same information travels between the transmitting server and the first router N times (N being the number of receivers). If the server routes packets to different links, then the same information naturally travels in the following link less than N times. This method is called unicast transmission. The unicast method of transmitting is poorly suited to mass distribution. To

overcome this shortcoming, a method of multicast transmission has been developed, in which the transmitter sends data and receivers interested in that data receive it, while others filter it away.

Figure 1 shows the principle of multicast transmission. Receivers 1, 2 and 3 are all part of the same multicast group to which the host server 4, (Host), transmits data. The Host only transmits the data once, and the following routers only send the data in the necessary directions once. It is worth mentioning that in interactive data transfer, all servers 1 to 4 are host servers. Multicast is an excellent method for, for example, forming and maintaining a video conference between several participants, for transferring the same video to several receivers, etc. The multicast data transfer is facilitated by a protocol called IGMP (Internet Group Management Protocol), further information of which is available in its defining standard RFC 1112. The protocol will be briefly explained below.

Each group using a multicast service is identified by a unique class D IP address which differs from all other IP addresses. The address space of class D spans from 224.0.0.0 to 239.255.255.255. The receiver address contained in the multicast packet is, therefore, the address of a group, not the address of an individual device as is the case with the unicast method of transmission. Hence, each packet in the same service group has the same address, based on which the members of the group receive the correct packets and filter others away. The members of the group can be located anywhere in the Internet. They can join the group at any time by notifying the multicast router. The UDP protocol, instead of TCP, is used for relaying the packets. The essential difference between the protocols is that TCP is connection-based, the receiver sending an acknowledgement for the packet, and packets containing errors being re-sent. However, with the UDP protocol, the packet is transmitted, but its delivery cannot be verified, since in the absence of a return connection, the receiver will not send any acknowledgements to the transmitter. The members use the IGMP protocol to inform the multicast routers in their immediate neighbourhood of their membership in the group. The multicast routers send queries at irregular intervals, usually about once a minute, to the members (hosts) in their immediate neighbourhood, in order to find out the service groups used in the local area networks connected to the members. The members report in their replies all

the groups they belong to. A server can be connected to more than one network; then it will only send the reply to the interface where the query came from. If no replies are received from the members of a specific, earlier routed group, the multicast router will stop routing multicast packets of this group to the members.

The above brief description of the IGMP protocol indicates that its essential feature are the queries which the multicast router makes to neighbouring members as to their willingness to receive certain services. Whenever the router receives even a single positive reply, it will continue routing the service in question. If there are no replies, it will stop relaying packets of the subject service.

Multicast relaying can be used successfully in wireless mass distribution by transmitting multicast packets in, for example, the multiplexed transmission of digital television. Then, the replies of the members are facilitated in a manner which is in accordance with the invention.

Figure 2 shows schematically the principle of this arrangement. The transmitter 21 of the program is transmitting a digital TV transmission received by the sets 22. The sets select the channels the users want from the multiplexed transmission and display them on the screen. This is in itself a familiar technique.

In accordance with the invention, multicast packets of the service which the user wants can be added to the multiplexed transmission. This is done by way of the Internet service provider's local area network being connected through the multicast router 23 to the Internet. The service provider has for example chosen a number of multicast services from which the receivers can choose the ones they want. How the choice is made will be explained later. Let us assume that we want to receive from the Internet, and later transfer to the multiplexed digital TV transmission, the packets M of the multicast service. These packets and their route have been illustrated in the figure by a small box with the letter M. The table of the multicast router 23 contains information of the multicast services in the Internet which it is expected to receive. This means that packets arriving with the address of the service group M are allowed through. Hence, it will receive the packets M coming from the Internet and route them further to the local area network of the Internet service provider. The packets are also routed to the order server.

Router 24, which connects the local area network to the network of the digital TV operator 21, routes the packets M further to network 21. The operator will process the packets as necessary so that they can be transmitted in the multiplexed transmission of the general broadcast.

The set-top box connected to the subscriber's TV set 22 separates the data channel carrying the packets M from the multiplexed transmission. It identifies the packets on the basis of their addresses, and separates and relays them for further processing. The processing can take place in the set-top box, allowing the result to be displayed on the TV screen. Alternatively, the packets can be relayed further to the receiver's local area network (not shown in Figure 2), or temporarily stored in the memory of the set-top box.

When a receiver wishes to quit membership of the multicast group M, he will for instance click on, for example, the button of the electronic program guide. Then, the modem in the receiver set 22 contacts the order server 25 in the local area network of the Internet service provider. An alternative connection is created through the common analogue telephone network PSTN or through an ISDN network. In the latter case, the modem is an ISDN interface. A modem in the modem bank of the local area network identifies the incoming call, after which the router 24 will route the connection to the order server 25. The receiver sends an order to the order server, notifying of his quitting the membership of the multicast group M. The order server saves this information. The next time the multicast server polls its neighbouring servers, in accordance with the IGMP protocol, about their willingness to receive multicast packets, the order server 25 also receives the query. If even the last of the subscribers to the multicast group has quit its membership, the order server 25 will stop giving replies concerning the group in question. After this, the multicast router 23 will no longer allow packets arriving from the Internet into the local area network which means that they will not be arriving in the program broadcaster's 21 network either.

The description above illustrates the idea behind the invention. First, the order server receives the queries from the multicast router and notifies in its reply message which packets in the multicast group, i.e. which services, it wishes to receive. Secondly, the receivers notify, in a message (order) sent to the order server through a modem connection, from which group they want to receive packets, as well as of their desire to quit mem-

bership of the group. There can be thousands of sets receiving a digital television broadcast, and the order server has a record of all the memberships or non-memberships of a given multicast group. As long as there is at least one receiver in the multicast group, the order server will respond to the query from the multicast router by replying that packets from the service will be received. Only when there are no receivers who want the service will the multicast router reject the packets of the subject service, and they are removed from the multiplexed transmission of the TV broadcast.

In practice, it is probably preferable that the Internet service provider has chosen a number of multicast groups from which the users can select the ones they want. A list of the services on offer can be transmitted in the multiplexed transmission of the TV broadcast, e.g. in connection with an electronic program guide. Alternatively, the list would only exist at the order server, and the users would connect to this server via their modems to choose the multicast groups they want to belong to.

From the user's point, booking the service could be done with an HMTL or XML form, opened using a user ID and password. In connection with the booking, the order server would prepare a list of the ordered multicast services, in a form the digital TV set can read, and transmit it to the set. The same packet could also include orders from other similar servers or from, for example, the centralised database of the digital broadcasting company. There are no standardised formats for this information at the moment, but at its simplest it could be a text file of the Unix HOSTS file type. The receiver set needs information of the services ordered for it to be able to filter the incoming data.

The invention makes possible the transfer of multicast services, available on the Internet, to e.g. a digital TV environment in a simple and almost completely standardised way.

Figure 3 shows in more detail the application of the invention in a digital TV environment.

It shows three sub-networks which together form a Virtual Private Network (VPN). The sub-networks are connected to each other via the Internet, and are visible to the user as one single network. The creation of VPNs is well known in the field. At the bottom of the figure is the local area network of the Internet service provider with the same elements as illustrated in Fig-

ure 2. The same index numbers apply. In addition to the order server, the network may include several other servers carrying out other tasks; these are indicated in a general fashion by index number 31. This local area network is connected via a border router to a part of the VPN within the Internet.

The next item is the local area network of the service provider. On the one hand, it is connected to the Internet via router 33, and on the other, to the VPN via border router 34. The local area network can include several servers; two of these have been schematically indicated by index numbers 35 and 36. To prevent access from the Internet to certain parts of the local area network, a firewall 37 is used to separate segments of the local area network and to safeguard the data security of the VPN. The service provider or providers – there can be several – produce their own programs which the broadcaster transmits to receivers. The network of the service provider is as such not part of the invention but is shown merely to illustrate the entire system.

At the top, the broadcaster's network is shown. It is connected to the VPN via the border router 38. The broadcaster's LAN is shown with extremely few details, and the servers are illustrated by the one server 39. The network is also connected via the bridge 310 to the forming and broadcasting segment 311 of the multiplexed transmission. This segment symbolises all the functions necessary for processing the program data into a form in which it can be transmitted through radio waves to the receivers.

Since both service providers and Internet service providers deliver the information intended for broadcasting to the broadcaster's network, and all parties are within the same VPN, it is natural that the same address space is visible to all the parties. This address space need not be selected from the general Internet address space, it can be a totally private one. This DVB IP address space can be co-ordinated by e.g. the authorities or the broadcasting company, and addresses for each receiver set are reserved in it.

Receiver sets can have two addresses, one of which is part of the DVB address space. It is an address which is unique and specific to each set, not issued to any other receiver set. The other address is issued by the Internet service provider.

The Internet service provider receives from the Internet those multicast services of which the users have notified when they registered with the

order server 25 through a modem connection via the PSTN. Packets from other services are rejected by the multicast router 23. The packets are routed in the VPN to the broadcaster's network, as was explained in connection with Figure 2. Attention should be paid to the fact that the address of multicast packets in the VPN is now the DVB address. The route of the packets has been illustrated by small boxes with the letter M.

There are several alternatives concerning the addresses of the packets when they are in a multiplexed transmission.

First, addresses defined in the DVB IP address space can be used, because the addresses of the receiver sets are part of the DVB address space. In this case, the DVB address space reaches all the way to the receiving sets. The set checks whether the packet has the same address as that issued to the set by the Internet service provider. If this is the case, the packet is a multicast one and it will be received.

It is also possible to reserve a sufficiently large address space on the Internet for the entire DVB operation. In this case, no address transformations are required, which would simplify the reception of multicast packets. The problem is the capacity of the present Internet address space.

Another alternative is to partly use the same addresses in receiver sets. In this case, an arrangement called Conditional Access (CA) is applied for relaying the IP addresses, an arrangement which is capable of identifying the receiver or receivers. Here, only authorised receivers can descramble the coding and the scrambling done at the transmitting end. Codes for descrambling have been stored in the smart card which the user inserts in the set-top box card reader.

Figure 4 shows one possible embodiment of the invention in this case. It illustrates functions performed by the bridge 310, Figure 3, prior to the broadcast. The intention is to transform the address to be the same as the set's address, and to carry out CA coding.

Let us assume that the packet arriving at the separation segment 41 carries a class B address 161.29.152.2. The first three bytes (domain address) are separated. They identify the receiver set or group of receiver sets which are using Conditional Access. In segment 42, Conditional Access Code Search, the coding and the scrambling method (CA coding information) to be used for this Domain address group is searched from the data-

base. At the same time, the domain address is relayed to the IP domain conversion segment 43, which transforms the domain address, e.g. the above mentioned 161.29.152 is transformed into 10.10.10. The transformed domain address could be shared by all receiver sets which utilise the CA function. The said domain address could also be TV set specific, allowing the easy integration of DVB receiver sets with existing local area networks. After this, the transformed domain address and the original local address are combined at segment 44, resulting in the transforming of the address of the packet into 10.10.10.2. The packet then gets a CA coding and it is passed on for embedding into the multiplexed transmission.

A set utilising the CA function receives the transmission and performs de-multiplexing. It accepts packets carrying the same address as its TV set address, in this case 10.10.10.2. It carries out decoding of the packet, descrambles it and sends it through the bridge into a local area network which can be the receiver's home network. The above functions can be carried out in the set-top box of a digital TV set.

It is also possible to transmit individually targeted packets via the IP network to digital receiver sets and devices possibly connected to them. A prerequisite for relaying IP packets is that the transmitter of the packets can identify the end receiver by a certain unique IP address. However, there are certain problems connected with issuing a unique IP address to each receiver. It is difficult - if not impossible - to allocate a sufficiently large address space from the present Internet address space for DVB data distribution use (millions of addresses). In addition, even if a unique address is allocated to each receiver set, the problem of configuring the set still remains. Who would carry it out, and what to do when the set has to be replaced? Who is in response of the co-ordination of IP numbers, how to fit the unique number in with existing local area networks to which the receiver set may possibly be connected?

As one answer to these questions, we can think of a solution where a network separated from the general IP address space is arranged for DVB. This network can be shared between TV companies, multiplexed transmission administrators, Internet operators and external service providers through a border router. In this case, the data network of DVB resembles the companies' internal networks and has the technical structure of a Virtual Private

Network (VPN). The services produced for this VPN must originate from within the network. This aside, each service provider can use his chosen methods for producing the services and required data transmissions. However, the required technology exists and is readily available.

VPN will solve the problem of the IP address space but not that of co-ordinating and configuring the IP numbers of receiver sets. As a solution to this, a method can be considered, which utilises the set identifying procedure in connection with the smart card.

When the IP packets intended for receiver sets arrive at the remote bridge where they will be coded into the format required by DVB transmissions, a code will be sought, based on the packet address (i.e. actually based on the receiver), which will only effect the authorisation of the set with the receiver's smart card inserted. At this stage, then, the transformation is made from the IP address into the Conditional Access (CA) authorisation code corresponding to the receiver's smart card.

In remote bridging, the IP address is transformed (mainly) into a standard address which in principle is the same for all receiver sets. This means that all receiver sets can be identical when they leave the factory - they can all be configured to have the same IP address ready. To avoid any conflicts, it pays to reserve this standard address from the international IP address space.

If the receiver set is connected to an existing network, the IP address can in remote bridging be transformed into a receiver defined address instead of the standard one. This IP transformation may require manual configuring of the remote bridge, so it could be a paid service. We can assume that a user who wants to connect his receiver set to his own local area network, is also capable of changing his set's fixed IP address into one he has himself defined.

In any case, since the identification of the set is carried out by the CA code, the IP address can be allowed through as it is, after the authorisation has been done.

Since it pays to reserve the standard receiver set IP address from the general IP address space, and since the same address can be shared by almost all users, and since the smallest address space which can be reserved at a time is a class C address space covering 254 addresses, why

not reserve an entire class C address space for the receivers? In this case, the receiver set in each home could relay information to a maximum of 253 additional devices connected to a network - for instance via a wireless one. The use of a class C address space would in practice mean that, at the remote bridge, the authorisation code could be sought based on the three highest bytes of the IP address (using a class C mask 255.255.255.0), and the lowest byte would be allowed straight through into the IP address relayed to the receiver set.

By joining the IP address with the authorisation code, both someone living in a remote cottage and the IT requirements of a company can be equally served.

It is possible to implement the invention in other ways than those described above while adhering to the methods defined in the patent claims. The application system can be other than a digital television system. Any system without a return connection, be it wireless or cable based, is suitable for this application. The given examples have described the return connection to be a modem connection through PSTN or ISDN networks. This is not obligatory; the return connection can be arranged in other ways. One possible method is to integrate a cellular phone in the receiver set. In this case, the telephone will contact the order server at the Internet service provider. Another possibility is to use a Short Message Service (SMS); in this case, the SMS is relayed to the service provider. In such cases, the receiver set could be a device totally independent of the electrical mains and telephone trunk network, such as a battery powered TV set.

Patent claims

1. A system for implementing an internet protocol multicast service, including:

a multicast router which from time to time sends the neighbouring servers a query about whether they want to receive packets of a multicast service from the Internet,

at least one router which responds to the query by sending a reply message containing information about willingness to receive packets of the multicast service,

where the multicast router routes packets of the multicast service to the server in question, when the information indicates willingness to receive packets of this service, but stops routing the packets of the multicast service to the server when the information indicates a wish to quit this service,

characterised in that the system also includes,

a transmission system, to which the packets of the services notified by the server in its reply are also routed, and which further transmits the packets, through a channel without a return connection, to receiver sets,

devices in the receiver set for forming a temporary connection with the server, where the receiver informs the server, through the temporary connection, which multicast service packets it wants to receive.

2. A system according to claim 1, characterised in that the server contains a table which includes information of all the multicast services of which the receiver sets have notified it through the temporary connection, and in that in its reply to the query of the multicast router, the server reports the information in question.

3. A system according to claim 1, characterised in that the devices in the receiver set for forming the temporary connection include a modem, where the temporary connection is a modem connection through an analogue telephone network.

4. A system according to claim 1, characterised in that the transmission system is a digital television system which processes the multicast packets routed to it in the manner required by the system prior to their placing in a multiplexed transmission.

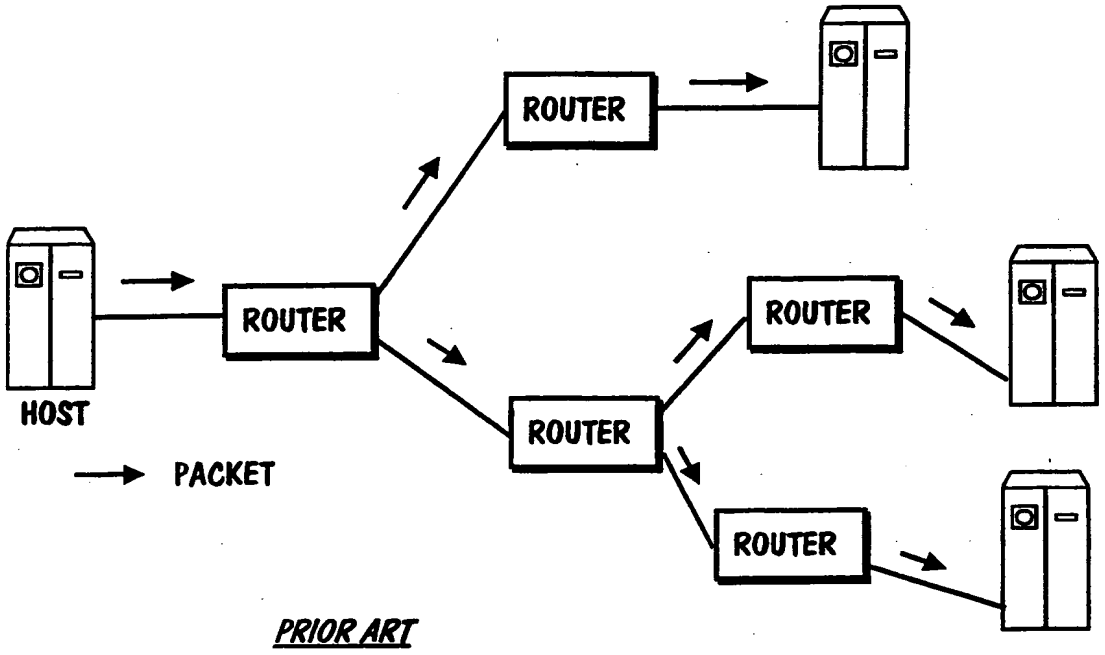
ROUTER
ROUTER
ROUTER
ROUTER
ROUTER
HOST
PACKET
PRIOR ART

FIG. 1

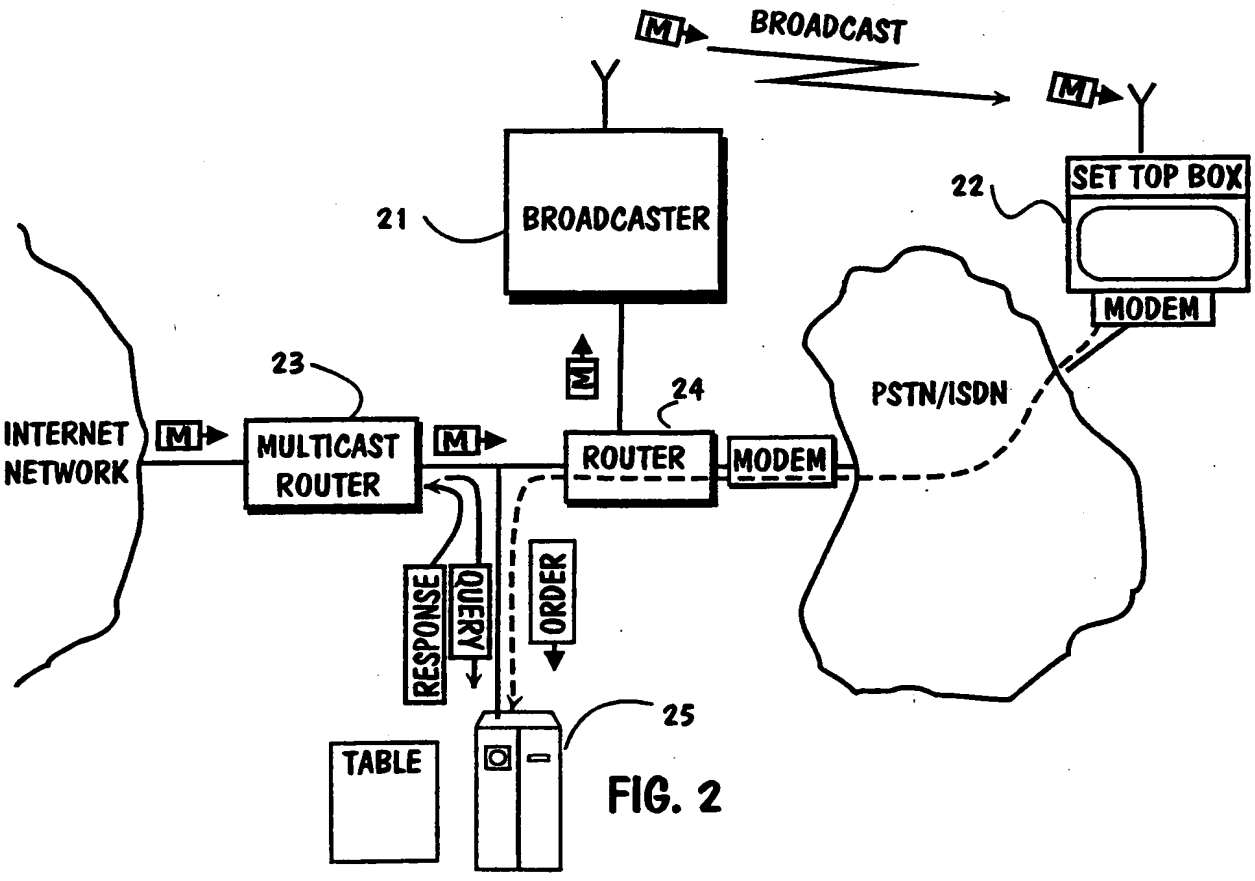
M
BROADCAST
M
SET TOP BOX
22
21
BROADCASTER
MODEM
M
23
24
PSTN/ISDN
INTERNET
NETWORK
M
MULTICAST
ROUTER
M
ROUTER
MODEM
RESPONSE
QUERY
ORDER
25
TABLE

FIG. 2

5. A system according to claim 1, characterised in that it includes a Virtual Private Network VPN, and in that the server and the transmission system belong to different sub-networks.

6. A system according to claim 1, characterised in that the receiver set is a television set in accordance with the digital television system.

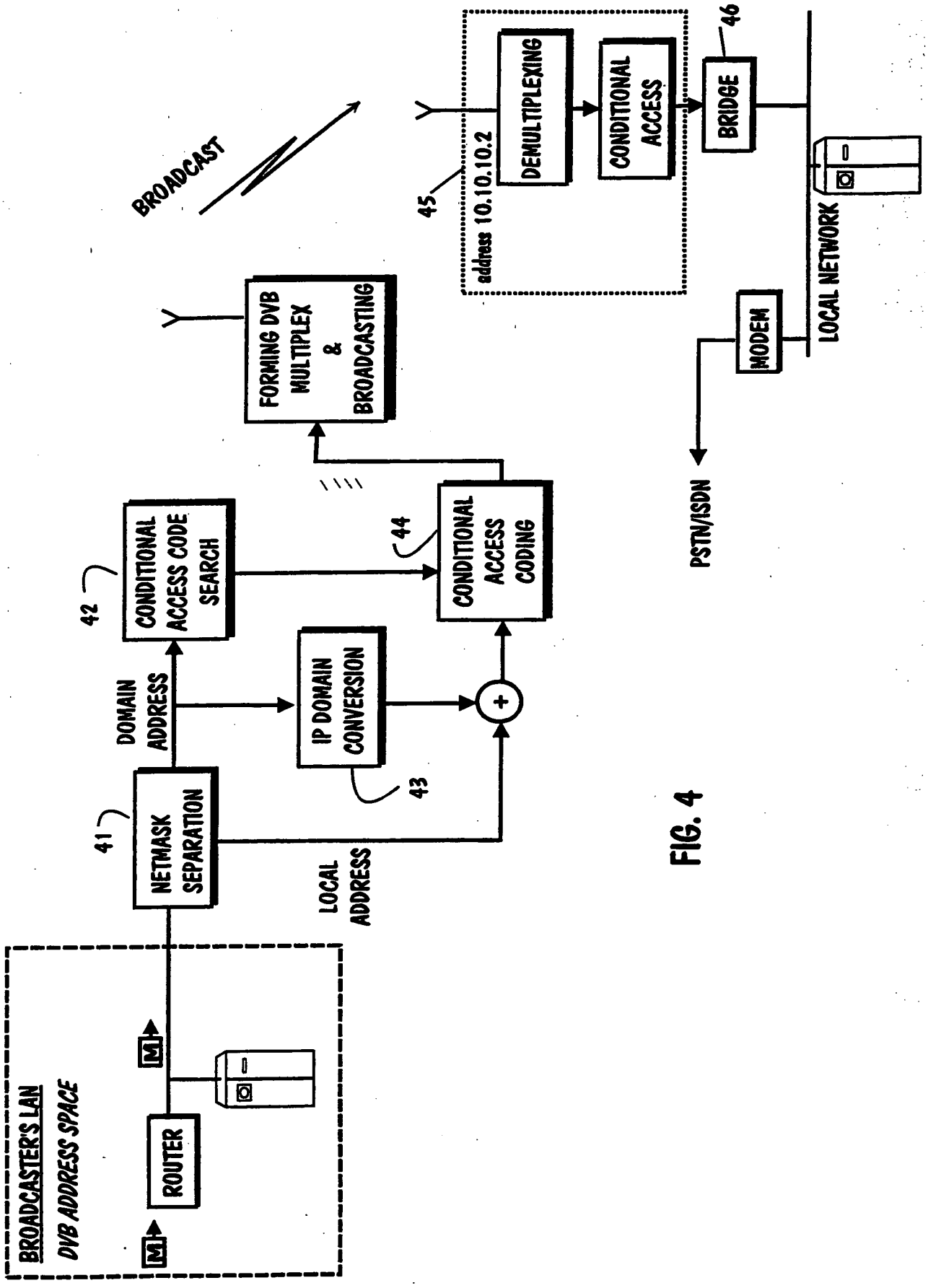
BROADCASTER'S LAN
DVB ADDRESS SPACE
ROUTER
M
M
NETMASK SEPARATION
41
LOCAL ADDRESS
DOMAIN ADDRESS
IP DOMAIN CONVERSION
43
CONDITIONAL ACCESS CODE SEARCH
42
CONDITIONAL ACCESS CODING
44
FORMING DVB MULTIPLEX & BROADCASTING
BROADCAST
45
address 10.10.10.2
DEMULTIPLEXING
CONDITIONAL ACCESS
BRIDGE
46
LOCAL NETWORK
MODEM
PSTN/ISDN

FIG. 4

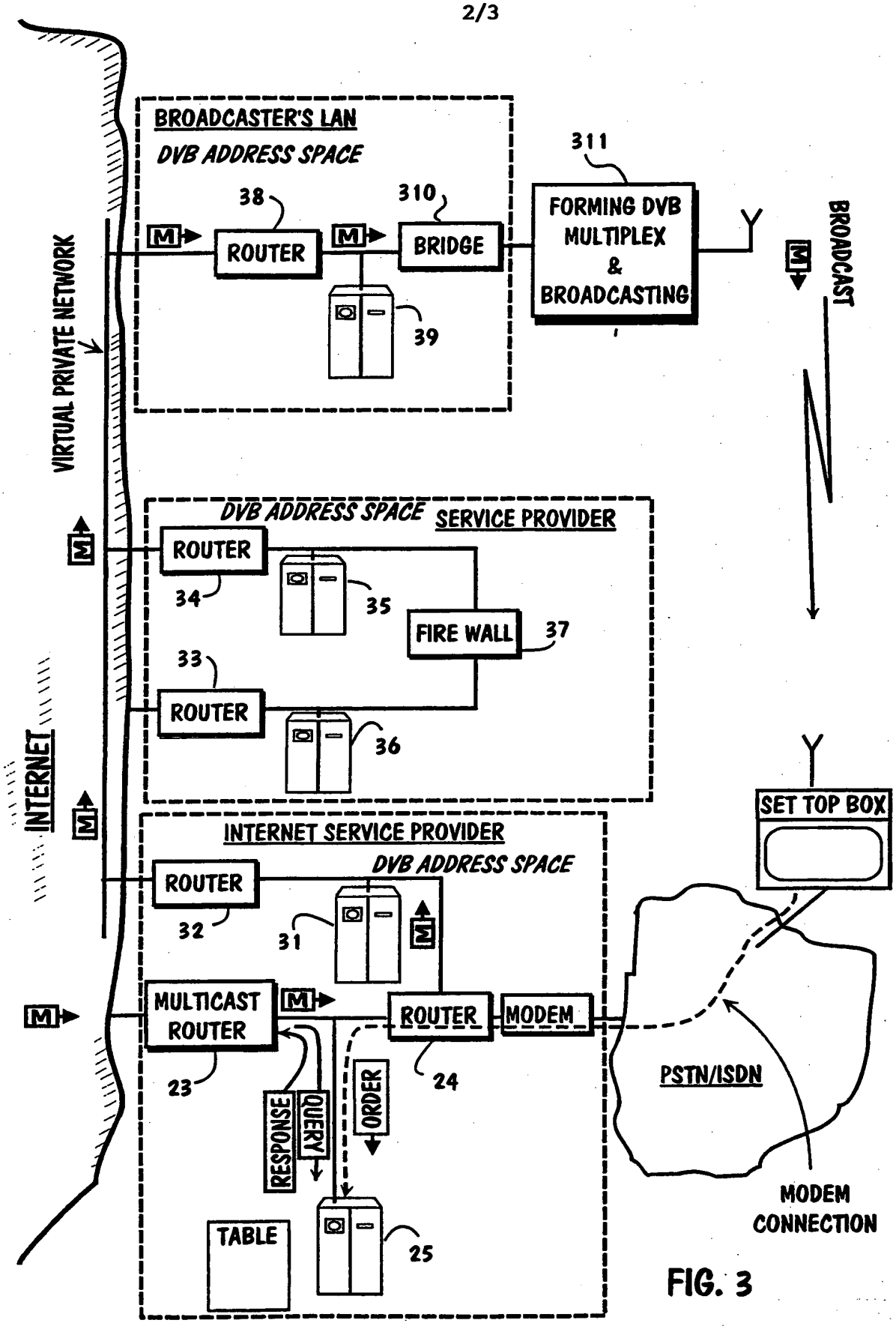
BROADCASTER'S LAN
DVB ADDRESS SPACE
311
38
310
ROUTER
BRIDGE
FORMING DVB MULTIPLEX & BROADCASTING
BROADCAST
39
VIRTUAL PRIVATE NETWORK
DVB ADDRESS SPACE
SERVICE PROVIDER
ROUTER
34
35
FIRE WALL
37
33
ROUTER
36
INTERNET
SET TOP BOX
INTERNET SERVICE PROVIDER
DVB ADDRESS SPACE
ROUTER
32
31
MULTICAST ROUTER
ROUTER
MODEM
23
24
RESPONSE
QUERY
ORDER
PSTN/ISDN
TABLE
25
MODEM CONNECTION

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 00/00111

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5778187 A (A.M. MONTEIRO ET AL), 7 July 1998 (07.07.98), figures 5,18 ---	1-6
A	US 5761602 A (L. WAGNER ET AL), 2 June 1998 (02.06.98) --- --------	1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 00/00111

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04L 12/18, H04L 12/28, H04Q 11/04 // T04N 7/173S
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0876029 A2 (SONY CORPORATION), 4 November 1998 (04.11.98), column 22, line 49 - column 23, line 25, figure 1 --	1-6
X	EP 0838929 A1 (NEXTLEVEL SYSTEMS, INC.), 29 April 1998 (29.04.98), column 4, line 6 - line 40 --	1-6
P,X	EP 0935381 A2 (GENERAL INSTRUMENT CORPORATION), 11 August 1999 (11.08.99), figure 1, abstract --	1-6

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 June 2000	28 -06- 2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Kristoffer Ogebjer / MRo Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.
PCT/FI 00/00111

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0876029 A2	04/11/98	JP 10303983 A	13/11/98
EP 0838929 A1	29/04/98	CA 2218798 A	28/04/98
		NO 974955 A	29/04/98
EP 0935381 A2	11/08/99	CN 1219053 A	09/06/99
US 5778187 A	07/07/98	AU 3002097 A	26/11/97
		US 5983005 A	09/11/99
		WO 9742582 A	13/11/97
US 5761602 A	02/06/98	NONE	